

# SEQUENCE LISTING

<110> Caimi, Perry G.

<120> Utilization of Starch Products for Biological Production by Fermentation

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<150> 60/405896

<151> 08-23-2002

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<170> PatentIn version 3.2

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gagattgatg ttgacaaaca agaaactctc attagcaata caaatgaaag cgctgctctt 1560
gccaatcaca aactccagcc ttgggatgct tttgtatta agataaacta a 1611

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<210> 17
<211> 536
<212> PRT
<213> Streptococcus mutans ATCC#25175D

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<400> 17
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1          5          10          15
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```
Lys Ser Phe Met Asp Thr Asn Gly Asp Gly Ile Gly Asp Leu Lys Gly
          20          25          30
```

```
Ile Thr Ser Lys Leu Asp Tyr Leu Gln Lys Leu Gly Val Met Ala Ile
          35          40          45
```

```
Trp Leu Ser Pro Val Tyr Asp Ser Pro Met Asp Asp Asn Gly Tyr Asp
          50          55          60
```

```
Ile Ala Asn Tyr Glu Ala Ile Ala Asp Ile Phe Gly Asn Met Ala Asp

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65	70	75	80
Met Asp Asn Leu	Leu Thr Gln Ala Lys	Met Arg Asp Ile Lys	Ile Ile
	85	90	95
Met Asp Leu Val	Val Asn His Thr Ser	Asp Glu His Thr Trp	Phe Ile
	100	105	110
Glu Ala Arg	Glu His Pro Asp Ser	Ser Glu Arg Asp Tyr	Tyr Ile Trp
	115	120	125
Cys Asp Gln Pro Asn Asp	Leu Glu Ser Ile Phe	Gly Gly Ser Ala Trp	
	130	135	140
Gln Tyr Asp Asp Lys	Ser Asp Gln Tyr Tyr	Leu His Phe Phe Ser	Lys
	145	150	155
Lys Gln Pro Asp	Leu Asn Trp Glu Asn	Ala Asn Leu Arg Gln	Lys Ile
	165	170	175
Tyr Asp Met	Met Asn Phe Trp Ile	Asp Lys Gly Ile Gly	Gly Phe Arg
	180	185	190
Met Asp Val	Ile Asp Met Ile	Gly Lys Ile Pro Ala	Gln His Ile Val
	195	200	205
Ser Asn Gly Pro Lys	Leu His Ala Tyr Leu	Lys Glu Met Asn Ala Ala	
	210	215	220
Ser Phe Gly Gln His	Asp Leu Leu Thr Val	Gly Glu Thr Trp Gly	Ala
	225	230	235
Thr Pro Glu Ile	Ala Lys Gln Tyr Ser	Asn Pro Val Asn His	Glu Leu
	245	250	255
Ser Met Ile	Phe Gln Phe Glu His	Ile Gly Leu Gln His	Lys Pro Glu
	260	265	270
Ala Pro Lys	Trp Asp Tyr Val	Lys Glu Leu Asn Val	Pro Ala Leu Lys
	275	280	285
Thr Ile Phe Asn Lys	Trp Gln Thr Glu Leu Glu	Leu Gly Gln Gly Trp	
	290	295	300
Asn Ser Leu Phe Trp	Asn Asn His Asp Leu	Pro Arg Val Leu Ser	Ile
	305	310	315
Trp Gly Asn Thr	Gly Lys Tyr Arg Glu	Lys Ser Ala Lys Ala	Leu Ala
	325	330	335
Ile Leu Leu His	Leu Met Arg Gly Thr	Pro Tyr Ile Tyr Gln	Gly Glu
	340	345	350

Glu Ile Gly Met Thr Asn Tyr Pro Phe Lys Asp Leu Asn Glu Leu Asp  
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 Asp Ile Glu Ser Leu Asn Tyr Ala Lys Glu Ala Phe Thr Asn Gly Lys  
           370                                  375                                  380  
 Ser Met Glu Thr Ile Met Asp Ser Ile Arg Met Ile Gly Arg Asp Asn  
   385                                  390                                  395                                  400  
 Ala Arg Thr Pro Met Gln Trp Asp Ala Ser Gln Asn Ala Gly Phe Ser  
                                   405                                  410                                  415  
 Thr Ala Asp Lys Thr Trp Leu Pro Val Asn Pro Asn Tyr Lys Asp Ile  
                                   420                                  425                                  430  
 Asn Val Gln Ala Ala Leu Lys Asn Ser Asn Ser Ile Phe Tyr Thr Tyr  
           435                                  440                                  445  
 Gln Gln Leu Ile Gln Leu Arg Lys Glu Asn Asp Trp Leu Val Asp Ala  
           450                                  455                                  460  
 Asp Phe Glu Leu Leu Pro Thr Ala Asp Lys Val Phe Ala Tyr Leu Arg  
   465                                  470                                  475                                  480  
 Lys Val Arg Glu Glu Arg Tyr Leu Ile Val Val Asn Val Ser Asp Gln  
                                   485                                  490                                  495  
 Glu Glu Val Leu Glu Ile Asp Val Asp Lys Gln Glu Thr Leu Ile Ser  
                                   500                                  505                                  510  
 Asn Thr Asn Glu Ser Ala Ala Leu Ala Asn His Lys Leu Gln Pro Trp  
           515                                  520                                  525  
 Asp Ala Phe Cys Ile Lys Ile Asn  
           530                                  535

<210> 18  
 <211> 35  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer

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35

<210> 19  
 <211> 37  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer

<400> 19  
 accttaatta aggttattcc ggatcggttt ccatggc 37

<210> 20  
 <211> 89  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer

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<210> 21  
 <211> 93  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer

<400> 21  
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 atgctccagc ttattccgga tcggtttcca tgg 93

<210> 22  
 <211> 89  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer

<400> 22  
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<210> 23  
 <211> 93  
 <212> DNA  
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<220>  
 <223> Primer

<400> 23  
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<210> 24  
 <211> 19  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> NPR Signal



<400> 24

Met Asn Lys Glu Pro Thr Met Thr Thr Phe Asn Arg Thr Ile Pro Asp  
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Ala Ile Arg

<210> 25

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> Bifidobacterium breve Signal

<400> 25

Met Ser Leu Thr Ile Ser Leu Pro Gly Val Gln Ala Ser Ala  
1 5 10

<210> 26

<211> 62

<212> DNA

<213> Artificial Sequence

<220>

<223> Bifidobacterium breve signal

<400> 26

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ac 62

<210> 27

<211> 42

<212> DNA

<213> Artificial Sequence

<220>

<223> NPR Signal

<400> 27

atgagtttaa ccatcagtct gccgggtggt caggctagcg cg 42

<210> 28

<211> 1877

<212> DNA

<213> Bifidobacterium breve

<400> 28

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acccgcgcag cttcaaggac gttaacggcg acggcatcgg cgacatcgcc ggcgttaccg 180

agaaaatgga ctacctgaaa aacctcggcg tggacgccat ctggctctcc ccgttctacc 240

cctccgatct ggcggacggc ggctacgacg tgatcgacta ccgcaacgtc gaccgcgcac 300

tgggcaccat ggacgacttc gacgccatgg ccaaagccgc gcatgaggcc ggcattcaagg 360

tgatcgtgga catcgtgccc aatcacaccg ccgacaagca cgtgttcttc aaggaagccc 420

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 cgtgggttat caagtag 1877

<210> 29  
 <211> 624  
 <212> PRT  
 <213> Bifidobacterium breve

<400> 29

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Asp Ala Ile Arg Met Thr Ala Asn Asn Leu Asn Asp Asp Trp Trp Lys  
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Gln Ala Val Val Tyr Gln Ile Tyr Pro Arg Ser Phe Lys Asp Val Asn  
 35 40 45

Gly Asp Gly Ile Gly Asp Ile Ala Gly Val Thr Glu Lys Met Asp Tyr  
 50 55 60

Leu Lys Asn Leu Gly Val Asp Ala Ile Trp Leu Ser Pro Phe Tyr Pro  
 65 70 75 80

Ser Asp Leu Ala Asp Gly Gly Tyr Asp Val Ile Asp Tyr Arg Asn Val  
 85 90 95

Asp Pro Arg Leu Gly Thr Met Asp Asp Phe Asp Ala Met Ala Lys Ala  
 100 105 110

Ala His Glu Ala Gly Ile Lys Val Ile Val Asp Ile Val Pro Asn His  
 115 120 125

Thr Ala Asp Lys His Val Phe Phe Lys Glu Ala Leu Ala Ala Glu Pro  
 130 135 140

Gly Ser Pro Ala Arg Asp Arg Tyr Ile Phe Arg Asp Gly Arg Gly Glu  
 145 150 155 160

His Gly Glu Leu Pro Pro Asn Asp Trp Gln Ser Phe Phe Gly Gly Pro  
 165 170 175

Ala Trp Ala Arg Val Ala Asp Gly Gln Trp Tyr Leu His Leu Phe Asp  
 180 185 190

Lys Ala Gln Pro Asp Val Asn Trp Lys Asn Pro Asp Ile His Glu Glu  
 195 200 205

Phe Lys Lys Thr Leu Arg Phe Trp Ser Asp His Gly Thr Asp Gly Phe  
 210 215 220

Arg Ile Asp Val Ala His Gly Leu Ala Lys Asp Leu Glu Ser Lys Pro  
 225 230 235 240

Leu Glu Glu Leu Gly Arg Glu Tyr Ser Val Val Gly Val Leu Asn His  
 245 250 255

Asp Phe Ser His Pro Leu Phe Asp Arg Arg Glu Val His Asp Ile Tyr  
 260 265 270

Arg Glu Trp Arg Lys Val Phe Asn Glu Tyr Asp Pro Pro Arg Phe Ala  
 275 280 285

Val Ala Glu Ala Trp Val Val Pro Glu His Gln His Leu Tyr Ala Ser  
 290 295 300

Met Asp Glu Leu Gly Gln Ser Phe Asn Phe Asp Phe Ala Gln Ala Ser  
 305 310 315 320

Trp Tyr Ala Asp Glu Phe Arg Ala Ala Ile Ala Ala Gly Leu Lys Ala  
 325 330 335  
 Ala Ala Glu Thr Gly Gly Ser Thr Thr Thr Trp Val Met Asn Asn His  
 340 345 350  
 Asp Val Pro Arg Ser Pro Ser Arg Tyr Gly Leu Pro Gln Val Lys Gly  
 355 360 365  
 Ala Pro Tyr His Gln Leu Pro His Asp Trp Leu Leu Arg Asn Gly Thr  
 370 375 380  
 Thr Tyr Pro Glu Asp Arg Glu Leu Gly Thr Arg Arg Ala Arg Ala Ala  
 385 390 395 400  
 Ala Leu Met Glu Leu Gly Leu Pro Gly Ala Ala Tyr Ile Tyr Gln Gly  
 405 410 415  
 Glu Glu Leu Gly Leu Phe Glu Val Ala Asp Ile Pro Trp Asp Arg Leu  
 420 425 430  
 Glu Asp Pro Thr Ala Phe His Thr Ala Gln Ala Thr Met Asp Lys Gly  
 435 440 445  
 Arg Asp Gly Cys Arg Val Pro Ile Pro Trp Thr Ala Ala Asn Glu Pro  
 450 455 460  
 Thr Leu Ala Asp Phe Ser Arg Pro Ile Pro Ala Asp Asp Gly Thr Gly  
 465 470 475 480  
 Glu Asn His Val Pro Leu Cys Ala Ala Gly Gln Phe Gly Thr Gly Ala  
 485 490 495  
 Ser Phe Gly Phe Ser Pro Ala Thr Arg Ala Glu Gly Val Thr Pro Ala  
 500 505 510  
 Ala Asp Pro His Leu Pro Gln Pro Leu Trp Phe Lys Asp Tyr Ala Val  
 515 520 525  
 Asp Val Glu Gln Ala Asp Pro Asp Ser Met Leu Ala Leu Tyr His Ala  
 530 535 540  
 Ala Leu Ala Ile Arg Gln Glu Ser Leu Thr Ala Thr Arg Asp Thr Thr  
 545 550 555 560  
 Ala Glu Gln Val Asp Met Gly Pro Asp Val Val Ala Tyr Thr Arg Ala  
 565 570 575  
 Ala Val Gly Gly Arg Thr Phe Thr Ser Ile Thr Asn Phe Gly Thr Glu  
 580 585 590

Pro Val Glu Leu Pro Gly Gly Ser Val Val Leu Thr Ser Gly Pro Leu  
595 600 605

Thr Pro Asp Gly Gln Leu Pro Thr Asp Thr Ser Ala Trp Val Ile Lys  
610 615 620

<210> 30  
<211> 1611  
<212> DNA  
<213> Bifidobacterium breve

<400> 30  
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caaaagttag gggttatggc tatttggtc tctccagttt atgatagccc catggatgac 180  
aatggctatg acattgcgaa ctatgaagca attgcggata tttttggcaa tatggctgat 240  
atggataatt tgctgacgca ggcaaaaatg cgcgacataa aaatcattat ggatctagtg 300  
gttaatcata cctcagatga acatacttgg tttattgaag cacgtgagca tccagacagt 360  
tctgaacgcg attattatat ttggtgtgac cagccaaatg atttgaatc tattttcggg 420  
ggttctgctt ggcagtatga tgataagtcc gatcaatatt atttgcattt ttttagtaag 480  
aagcagccag atctaaactg ggaaaacgca aacttacgtc agaagattta tgatatgatg 540  
aatttctgga ttgataaagg tattggcggc tttcggatgg acgtcattga tatgattggg 600  
aaaattcctg ctacagcatat tgtcagtaac ggacaaaat tgcatgctta tcttaaggag 660  
atgaatgccg ctagttttgg tcaacatgat ctgctgactg tgggggaaac ttggggagca 720  
acgcctgaga ttgcgaagca atattcaaat ccagtcaatc acgaactctc tatgattttt 780  
caatttgaac atattggtct tcagcataaa ccagaagctc ctaaatggga ttatgtgaag 840  
gaacttaatg ttctgctttt aaaaacaatc ttaataaat ggcagactga gttggaatta 900  
ggacaggggt ggaattcggt attctggaat aaccatgacc tgcctcgtgt tttatcaatc 960  
tggggaaata cgggcaaata tcgtgagaag tctgctaaag cactggctat tcttcttcac 1020  
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tttaaagatt taaatgaact tgatgatatt gaatcactta attatgctaa ggaagctttt 1140  
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gccagaacac ctatgcaatg ggatgcttct caaaatgccg gattttcaac agcggataaa 1260  
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gagattgatg ttgacaaaca agaaactctc attagcaata caaatgaaag cgctgctctt 1560  
gccaatcaca aactccagcc ttgggatgct ttttgtatta agataaacta a 1611

<210> 31  
 <211> 536  
 <212> PRT  
 <213> Bifidobacterium breve

<400> 31

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Met Gln Lys His Trp Trp His Lys Ala Thr Val Tyr Gln Ile Tyr Pro
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Lys Ser Phe Met Asp Thr Asn Gly Asp Gly Ile Gly Asp Leu Lys Gly
          20          25          30

Ile Thr Ser Lys Leu Asp Tyr Leu Gln Lys Leu Gly Val Met Ala Ile
          35          40          45

Trp Leu Ser Pro Val Tyr Asp Ser Pro Met Asp Asp Asn Gly Tyr Asp
          50          55          60

Ile Ala Asn Tyr Glu Ala Ile Ala Asp Ile Phe Gly Asn Met Ala Asp
65          70          75          80

Met Asp Asn Leu Leu Thr Gln Ala Lys Met Arg Asp Ile Lys Ile Ile
          85          90          95

Met Asp Leu Val Val Asn His Thr Ser Asp Glu His Thr Trp Phe Ile
          100          105          110

Glu Ala Arg Glu His Pro Asp Ser Ser Glu Arg Asp Tyr Tyr Ile Trp
          115          120          125

Cys Asp Gln Pro Asn Asp Leu Glu Ser Ile Phe Gly Gly Ser Ala Trp
          130          135          140

Gln Tyr Asp Asp Lys Ser Asp Gln Tyr Tyr Leu His Phe Phe Ser Lys
145          150          155          160

Lys Gln Pro Asp Leu Asn Trp Glu Asn Ala Asn Leu Arg Gln Lys Ile
          165          170          175

Tyr Asp Met Met Asn Phe Trp Ile Asp Lys Gly Ile Gly Gly Phe Arg
          180          185          190

Met Asp Val Ile Asp Met Ile Gly Lys Ile Pro Ala Gln His Ile Val
          195          200          205

Ser Asn Gly Pro Lys Leu His Ala Tyr Leu Lys Glu Met Asn Ala Ala
          210          215          220

Ser Phe Gly Gln His Asp Leu Leu Thr Val Gly Glu Thr Trp Gly Ala
225          230          235          240

Thr Pro Glu Ile Ala Lys Gln Tyr Ser Asn Pro Val Asn His Glu Leu
          245          250          255

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Ser Met Ile Phe Gln Phe Glu His Ile Gly Leu Gln His Lys Pro Glu  
 260 265 270  
 Ala Pro Lys Trp Asp Tyr Val Lys Glu Leu Asn Val Pro Ala Leu Lys  
 275 280 285  
 Thr Ile Phe Asn Lys Trp Gln Thr Glu Leu Glu Leu Gly Gln Gly Trp  
 290 295 300  
 Asn Ser Leu Phe Trp Asn Asn His Asp Leu Pro Arg Val Leu Ser Ile  
 305 310 315 320  
 Trp Gly Asn Thr Gly Lys Tyr Arg Glu Lys Ser Ala Lys Ala Leu Ala  
 325 330 335  
 Ile Leu Leu His Leu Met Arg Gly Thr Pro Tyr Ile Tyr Gln Gly Glu  
 340 345 350  
 Glu Ile Gly Met Thr Asn Tyr Pro Phe Lys Asp Leu Asn Glu Leu Asp  
 355 360 365  
 Asp Ile Glu Ser Leu Asn Tyr Ala Lys Glu Ala Phe Thr Asn Gly Lys  
 370 375 380  
 Ser Met Glu Thr Ile Met Asp Ser Ile Arg Met Ile Gly Arg Asp Asn  
 385 390 395 400  
 Ala Arg Thr Pro Met Gln Trp Asp Ala Ser Gln Asn Ala Gly Phe Ser  
 405 410 415  
 Thr Ala Asp Lys Thr Trp Leu Pro Val Asn Pro Asn Tyr Lys Asp Ile  
 420 425 430  
 Asn Val Gln Ala Ala Leu Lys Asn Ser Asn Ser Ile Phe Tyr Thr Tyr  
 435 440 445  
 Gln Gln Leu Ile Gln Leu Arg Lys Glu Asn Asp Trp Leu Val Asp Ala  
 450 455 460  
 Asp Phe Glu Leu Leu Pro Thr Ala Asp Lys Val Phe Ala Tyr Leu Arg  
 465 470 475 480  
 Lys Val Arg Glu Glu Arg Tyr Leu Ile Val Val Asn Val Ser Asp Gln  
 485 490 495  
 Glu Glu Val Leu Glu Ile Asp Val Asp Lys Gln Glu Thr Leu Ile Ser  
 500 505 510  
 Asn Thr Asn Glu Ser Ala Ala Leu Ala Asn His Lys Leu Gln Pro Trp  
 515 520 525

Asp Ala Phe Cys Ile Lys Ile Asn  
530 535

<210> 32  
<211> 1880  
<212> DNA  
<213> Bifidobacterium breve

<400> 32  
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ccccgaaccc gtggtggtcg aacgccgtcg tctaccagat ttaccacgt tccttccagg 180  
acacgaacgg cgatggtttc ggagatctta agggcattac ttcccgcctc gactatcttg 240  
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gcctgttcct cgacaaccac gaccagccgc gtgtcgtctc ccgttggggc gacgacacca 1200  
gcaagaccgg ccgcatccgc tccgccaagg cgctcgcgt gctgctgcac atgcaccgcg 1260  
gcactccgta tgtctaccag ggcgaggagc tcggcatgac caatgcgcac ttcacctcgc 1320  
tcgaccagta ccgcgacctc gaatccatca acgcctacca tcaacgcgtc gaggaaccg 1380  
ggatacggac atcggagacc atgatgcgat ccctcgcccg atacggcagg gacaacgcgc 1440  
gcaccccgat gcaatgggac gactccacct acgccggtt caccatgccc gacgccccgg 1500  
tcgaaccctg gatcgccgtc aaccggaacc acacggagat caacgccgcc gacgagatcg 1560  
acgacccccg ctccgtgtac tcgttcaca aacgggtcat cgccctgctg cacaccgacc 1620  
ccgtggtcgc cgccggcgac taccgacgcg tggaaccgg aaacgaccgg atcatgcct 1680  
tcaccagaac cctcgacgag cgaaccatcc tcaccgtcat caacctctcg cccacacagg 1740



ccgcaccggc cggagaactg gaaacgatgc ccgacggcac gatcctcatc gccaacacgg 1800  
acgatcccggt aggaacacgtg aaaaccacgg gaacactcgg accatgggag gcgttcgcca 1860  
tggaaccga tccggaataa 1880

<210> 33  
<211> 625  
<212> PRT  
<213> Bifidobacterium breve  
<400> 33

Met Asn Lys Glu Pro Thr Met Thr Thr Phe Asn Arg Thr Ile Ile Pro  
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Asp Ala Ile Arg Met Met Thr Ser Phe Asn Arg Glu Pro Leu Pro Asp  
20 25 30

Ala Val Arg Thr Asn Gly Ala Ser Pro Asn Pro Trp Trp Ser Asn Ala  
35 40 45

Val Val Tyr Gln Ile Tyr Pro Arg Ser Phe Gln Asp Thr Asn Gly Asp  
50 55 60

Gly Phe Gly Asp Leu Lys Gly Ile Thr Ser Arg Leu Asp Tyr Leu Ala  
65 70 75 80

Asp Leu Gly Val Asp Val Leu Trp Leu Ser Pro Val Tyr Arg Ser Pro  
85 90 95

Gln Asp Asp Asn Gly Tyr Asp Ile Ser Asp Tyr Arg Asp Ile Asp Pro  
100 105 110

Leu Phe Gly Thr Leu Asp Asp Met Asp Glu Leu Leu Ala Glu Ala His  
115 120 125

Lys Arg Gly Leu Lys Ile Val Met Asp Leu Val Val Asn His Thr Ser  
130 135 140

Asp Glu His Ala Trp Phe Glu Ala Ser Lys Asp Lys Asp Asp Pro His  
145 150 155 160

Ala Asp Trp Tyr Trp Trp Arg Pro Ala Arg Pro Gly His Glu Pro Gly  
165 170 175

Thr Pro Gly Ala Glu Pro Asn Gln Trp Gly Ser Tyr Phe Gly Gly Ser  
180 185 190

Ala Trp Glu Tyr Cys Pro Glu Arg Gly Glu Tyr Tyr Leu His Gln Phe  
195 200 205

Ser Lys Lys Gln Pro Asp Leu Asn Trp Glu Asn Pro Ala Val Arg Arg  
210 215 220

Ala Val Tyr Asp Met Met Asn Trp Trp Leu Asp Arg Gly Ile Asp Gly  
 225 230 235 240  
 Phe Arg Met Asp Val Ile Thr Leu Ile Ser Lys Arg Thr Asp Ala Asn  
 245 250 255  
 Gly Arg Leu Pro Gly Glu Thr Gly Ser Glu Leu Gln Asp Leu Pro Val  
 260 265 270  
 Gly Glu Glu Gly Tyr Ser Asn Pro Asn Pro Phe Cys Ala Asp Gly Pro  
 275 280 285  
 Arg Gln Asp Glu Phe Leu Ala Glu Met Arg Arg Glu Val Phe Asp Gly  
 290 295 300  
 Arg Asp Gly Phe Leu Thr Val Gly Glu Ala Pro Gly Ile Thr Ala Glu  
 305 310 315 320  
 Arg Asn Glu His Ile Thr Asp Pro Ala Asn Gly Glu Leu Asp Met Leu  
 325 330 335  
 Phe Leu Phe Glu His Met Gly Val Asp Gln Thr Pro Glu Ser Lys Trp  
 340 345 350  
 Asp Asp Lys Pro Trp Thr Pro Ala Asp Leu Glu Thr Lys Leu Ala Glu  
 355 360 365  
 Gln Gln Asp Ala Ile Ala Arg His Gly Trp Ala Ser Leu Phe Leu Asp  
 370 375 380  
 Asn His Asp Gln Pro Arg Val Val Ser Arg Trp Gly Asp Asp Thr Ser  
 385 390 395 400  
 Lys Thr Gly Arg Ile Arg Ser Ala Lys Ala Leu Ala Leu Leu Leu His  
 405 410 415  
 Met His Arg Gly Thr Pro Tyr Val Tyr Gln Gly Glu Glu Leu Gly Met  
 420 425 430  
 Thr Asn Ala His Phe Thr Ser Leu Asp Gln Tyr Arg Asp Leu Glu Ser  
 435 440 445  
 Ile Asn Ala Tyr His Gln Arg Val Glu Glu Thr Gly Ile Arg Thr Ser  
 450 455 460  
 Glu Thr Met Met Arg Ser Leu Ala Arg Tyr Gly Arg Asp Asn Ala Arg  
 465 470 475 480  
 Thr Pro Met Gln Trp Asp Asp Ser Thr Tyr Ala Gly Phe Thr Met Pro  
 485 490 495

Asp Ala Pro Val Glu Pro Trp Ile Ala Val Asn Pro Asn His Thr Glu  
500 505 510

Ile Asn Ala Ala Asp Glu Ile Asp Asp Pro Asp Ser Val Tyr Ser Phe  
515 520 525

His Lys Arg Leu Ile Ala Leu Arg His Thr Asp Pro Val Val Ala Ala  
530 535 540

Gly Asp Tyr Arg Arg Val Glu Thr Gly Asn Asp Arg Ile Ile Ala Phe  
545 550 555 560

Thr Arg Thr Leu Asp Glu Arg Thr Ile Leu Thr Val Ile Asn Leu Ser  
565 570 575

Pro Thr Gln Ala Ala Pro Ala Gly Glu Leu Glu Thr Met Pro Asp Gly  
580 585 590

Thr Ile Leu Ile Ala Asn Thr Asp Asp Pro Val Gly Asn Leu Lys Thr  
595 600 605

Thr Gly Thr Leu Gly Pro Trp Glu Ala Phe Ala Met Glu Thr Asp Pro  
610 615 620

Glu  
625

<210> 34  
<211> 1673  
<212> DNA  
<213> Bifidobacterium breve + Streptococcus mutans

<400> 34  
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acatgcaaaa acattggtgg cacaaggcaa ctgtttatca aatttatcca aaatctttta 120  
tggtataaaa ttggtgatga attggtgatc tcaaaggtat tacgagtaaa ttggattatt 180  
tgcaaaagtt agggggttatg gctatattggc tatctccagt ttatgatagc cccatggatg 240  
acaatggcta tgacattgcg aactatgaag caattgcgga tatttttggc aatatggctg 300  
atatggataa tttgctgacg caggcaaaaa tgcgcgacat aaaaatcatt atggatctag 360  
tggttaatca tacctcagat gaacatactt ggtttattga agcacgtgag catccagaca 420  
gttctgaacg cgattattat atttggtgtg accagccaaa tgatttggaa tctattttcg 480  
gtggttctgc ttggcagtat gatgataagt ccgatcaata ttatttgcatt ttttttagta 540  
agaagcagcc agatctaaac tgggaaaacg caaacttacg tcagaagatt tatgatatga 600  
tgaatttctg gattgataaa ggtattggcg gctttcggat ggacgtcatt gatatgattg 660  
ggaaaattcc tgctcagcat attgtcagta acggaccaaa attgcatgct tatcttaagg 720  
agatgaatgc cgctagtttt ggtcaacatg atctgctgac tgtgggggaa acttggggag 780  
caacgcctga gattgcgaag caatattcaa atccagtcaa tcacgaactc tctatgattt 840

ttcaatttga acatattggt cttcagcata aaccagaagc tcctaaatgg gattatgtga 900  
 aggaacttaa tgttcctgct ttaaaaacaa tctttaataa atggcagact gagttggaat 960  
 taggacaggg gtggaattcg ttattctgga ataaccatga cctgcctcgt gttttatcaa 1020  
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 accttatgcy tgggacacct tatatttatc aagggtgaaga gattgggatg accaattatc 1140  
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 ttacaaatgg taagtctatg gaaactatca tggacagtat tcgtatgatt ggccgtgata 1260  
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 ggctagtaga tgccgatttt gaattgctcc ctacagcggg caaagtattt gcctatttac 1500  
 gaaaggtaag agaagaaagg tatcttatag tggatcaatgt ttcagatcag gaagaagtcc 1560  
 tagagattga tgttgacaaa caagaaactc tcattagcaa tacaaatgaa agcgctgctc 1620  
 ttgccaatca caaactccag ccttgggatg cttttgtat taagataaac taa 1673

<210> 35  
 <211> 556  
 <212> PRT  
 <213> Bifidobacterium breve + Streptococcus mutans

<400> 35

Met Asn Lys Glu Pro Thr Met Thr Thr Phe Asn Arg Thr Ile Ile Pro  
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Asp Ala Ile Arg Met Gln Lys His Trp Trp His Lys Ala Thr Val Tyr  
 20 25 30

Gln Ile Tyr Pro Lys Ser Phe Met Asp Thr Asn Gly Asp Gly Ile Gly  
 35 40 45

Asp Leu Lys Gly Ile Thr Ser Lys Leu Asp Tyr Leu Gln Lys Leu Gly  
 50 55 60

Val Met Ala Ile Trp Leu Ser Pro Val Tyr Asp Ser Pro Met Asp Asp  
 65 70 75 80

Asn Gly Tyr Asp Ile Ala Asn Tyr Glu Ala Ile Ala Asp Ile Phe Gly  
 85 90 95

Asn Met Ala Asp Met Asp Asn Leu Leu Thr Gln Ala Lys Met Arg Asp  
 100 105 110

Ile Lys Ile Ile Met Asp Leu Val Val Asn His Thr Ser Asp Glu His  
 115 120 125

Thr Trp Phe Ile Glu Ala Arg Glu His Pro Asp Ser Ser Glu Arg Asp  
130 135 140

Tyr Tyr Ile Trp Cys Asp Gln Pro Asn Asp Leu Glu Ser Ile Phe Gly  
145 150 155 160

Gly Ser Ala Trp Gln Tyr Asp Asp Lys Ser Asp Gln Tyr Tyr Leu His  
165 170 175

Phe Phe Ser Lys Lys Gln Pro Asp Leu Asn Trp Glu Asn Ala Asn Leu  
180 185 190

Arg Gln Lys Ile Tyr Asp Met Met Asn Phe Trp Ile Asp Lys Gly Ile  
195 200 205

Gly Gly Phe Arg Met Asp Val Ile Asp Met Ile Gly Lys Ile Pro Ala  
210 215 220

Gln His Ile Val Ser Asn Gly Pro Lys Leu His Ala Tyr Leu Lys Glu  
225 230 235 240

Met Asn Ala Ala Ser Phe Gly Gln His Asp Leu Leu Thr Val Gly Glu  
245 250 255

Thr Trp Gly Ala Thr Pro Glu Ile Ala Lys Gln Tyr Ser Asn Pro Val  
260 265 270

Asn His Glu Leu Ser Met Ile Phe Gln Phe Glu His Ile Gly Leu Gln  
275 280 285

His Lys Pro Glu Ala Pro Lys Trp Asp Tyr Val Lys Glu Leu Asn Val  
290 295 300

Pro Ala Leu Lys Thr Ile Phe Asn Lys Trp Gln Thr Glu Leu Glu Leu  
305 310 315 320

Gly Gln Gly Trp Asn Ser Leu Phe Trp Asn Asn His Asp Leu Pro Arg  
325 330 335

Val Leu Ser Ile Trp Gly Asn Thr Gly Lys Tyr Arg Glu Lys Ser Ala  
340 345 350

Lys Ala Leu Ala Ile Leu Leu His Leu Met Arg Gly Thr Pro Tyr Ile  
355 360 365

Tyr Gln Gly Glu Glu Ile Gly Met Thr Asn Tyr Pro Phe Lys Asp Leu  
370 375 380

Asn Glu Leu Asp Asp Ile Glu Ser Leu Asn Tyr Ala Lys Glu Ala Phe  
385 390 395 400

Thr Asn Gly Lys Ser Met Glu Thr Ile Met Asp Ser Ile Arg Met Ile  
Page 29

	405	410	415
Gly Arg Asp Asn Ala Arg Thr Pro Met Gln Trp Asp Ala Ser Gln Asn	420	425	430
Ala Gly Phe Ser Thr Ala Asp Lys Thr Trp Leu Pro Val Asn Pro Asn	435	440	445
Tyr Lys Asp Ile Asn Val Gln Ala Ala Leu Lys Asn Ser Asn Ser Ile	450	455	460
Phe Tyr Thr Tyr Gln Gln Leu Ile Gln Leu Arg Lys Glu Asn Asp Trp	465	470	475
Leu Val Asp Ala Asp Phe Glu Leu Leu Pro Thr Ala Asp Lys Val Phe	485	490	495
Ala Tyr Leu Arg Lys Val Arg Glu Glu Arg Tyr Leu Ile Val Val Asn	500	505	510
Val Ser Asp Gln Glu Glu Val Leu Glu Ile Asp Val Asp Lys Gln Glu	515	520	525
Thr Leu Ile Ser Asn Thr Asn Glu Ser Ala Ala Leu Ala Asn His Lys	530	535	540
Leu Gln Pro Trp Asp Ala Phe Cys Ile Lys Ile Asn	545	550	555

<210> 36  
 <211> 1857  
 <212> DNA  
 <213> Bacillus and Bifidobacterium breve

<400> 36	
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gttaacggcg acggcatcgg cgacatcgcc ggcgttaccg agaaaatgga ctacctgaaa	180
aacctcggcg tggacgccat ctggctctcc ccgttctacc cctccgatct ggcggacggc	240
ggctacgacg tgatcgacta ccgcaacgtc gacccgagac tgggcaccat ggacgacttc	300
gacgccatgg ccaaagccgc gcatgaggcc ggcataaagg tgatcgaggga catcgtgccc	360
aatcacaccg ccgacaagca cgtgttcttc aagggaagccc tcgccgccga gcccggtccc	420
ccggcgcgcg accgctacat cttccgagac ggccgaggcg agcacggcga actgccgccc	480
aacgactggc agtccttctt cggcgggccc gcctgggctc gcgtggccga cggccagtgg	540
tatctgcacc tgttcgacaa ggcgaaccg gacgtcaact ggaagaacct ggacatccac	600
gaggaattca agaaaacct gcgcttctgg tccgaccacg gcaccgacgg cttccgcatc	660
gacgtggcgc acggtctggc caaagacctt gaatccaagc cgctggagga gctcggccgc	720

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 ctgcccggcg ccgcctatat ctatcagggc gaggagctgg gcctgtttga agtggccgat 1260  
 attccgtggg atcgactgga agatccgacc gctttccaca ccgctcaggc cacgatggac 1320  
 aagggccgag acggctgccg cgtgccgatt ccgtggaccg ctgcaaacga accgaccttg 1380  
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 tgcgccgcgc gccagttcgg caccggcgct tccttcggct tctcgccggc tacgcgcgct 1500  
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 gcggtggacg tggagcaggc cgaccggat tcaatgctcg cgctgtatca tgcggcgtt 1620  
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 accaacttcg gcaccgagcc ggtggagctg cctggaggct ccgtcgtgct gacgtccggc 1800  
 ccgctgaccc ccgacggcca gctccccacc gacacttctg cgtgggttat caagtag 1857

<210> 37  
 <211> 618  
 <212> PRT  
 <213> Bacillus and Bifidobacterium breve

<400> 37

Met Ser Leu Thr Ile Ser Leu Pro Gly Val Gln Ala Ser Ala Met Thr  
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Ala Asn Asn Leu Asn Asp Asp Trp Trp Lys Gln Ala Val Val Tyr Gln  
 20 25 30

Ile Tyr Pro Arg Ser Phe Lys Asp Val Asn Gly Asp Gly Ile Gly Asp  
 35 40 45

Ile Ala Gly Val Thr Glu Lys Met Asp Tyr Leu Lys Asn Leu Gly Val  
 50 55 60

Asp Ala Ile Trp Leu Ser Pro Phe Tyr Pro Ser Asp Leu Ala Asp Gly  
 65 70 75 80

Gly Tyr Asp Val Ile Asp Tyr Arg Asn Val Asp Pro Arg Leu Gly Thr  
 85 90 95

Met Asp Asp Phe Asp Ala Met Ala Lys Ala Ala His Glu Ala Gly Ile  
 100 105 110  
 Lys Val Ile Val Asp Ile Val Pro Asn His Thr Ala Asp Lys His Val  
 115 120 125  
 Phe Phe Lys Glu Ala Leu Ala Ala Glu Pro Gly Ser Pro Ala Arg Asp  
 130 135 140  
 Arg Tyr Ile Phe Arg Asp Gly Arg Gly Glu His Gly Glu Leu Pro Pro  
 145 150 155 160  
 Asn Asp Trp Gln Ser Phe Phe Gly Gly Pro Ala Trp Ala Arg Val Ala  
 165 170 175  
 Asp Gly Gln Trp Tyr Leu His Leu Phe Asp Lys Ala Gln Pro Asp Val  
 180 185 190  
 Asn Trp Lys Asn Pro Asp Ile His Glu Glu Phe Lys Lys Thr Leu Arg  
 195 200 205  
 Phe Trp Ser Asp His Gly Thr Asp Gly Phe Arg Ile Asp Val Ala His  
 210 215 220  
 Gly Leu Ala Lys Asp Leu Glu Ser Lys Pro Leu Glu Glu Leu Gly Arg  
 225 230 235 240  
 Glu Tyr Ser Val Val Gly Val Leu Asn His Asp Phe Ser His Pro Leu  
 245 250 255  
 Phe Asp Arg Arg Glu Val His Asp Ile Tyr Arg Glu Trp Arg Lys Val  
 260 265 270  
 Phe Asn Glu Tyr Asp Pro Pro Arg Phe Ala Val Ala Glu Ala Trp Val  
 275 280 285  
 Val Pro Glu His Gln His Leu Tyr Ala Ser Met Asp Glu Leu Gly Gln  
 290 295 300  
 Ser Phe Asn Phe Asp Phe Ala Gln Ala Ser Trp Tyr Ala Asp Glu Phe  
 305 310 315 320  
 Arg Ala Ala Ile Ala Ala Gly Leu Lys Ala Ala Ala Glu Thr Gly Gly  
 325 330 335  
 Ser Thr Thr Thr Trp Val Met Asn Asn His Asp Val Pro Arg Ser Pro  
 340 345 350  
 Ser Arg Tyr Gly Leu Pro Gln Val Lys Gly Ala Pro Tyr His Gln Leu  
 355 360 365



Pro His Asp Trp Leu Leu Arg Asn Gly Thr Thr Tyr Pro Glu Asp Arg  
370 375 380

Glu Leu Gly Thr Arg Arg Ala Arg Ala Ala Ala Leu Met Glu Leu Gly  
385 390 395 400

Leu Pro Gly Ala Ala Tyr Ile Tyr Gln Gly Glu Glu Leu Gly Leu Phe  
405 410 415

Glu Val Ala Asp Ile Pro Trp Asp Arg Leu Glu Asp Pro Thr Ala Phe  
420 425 430

His Thr Ala Gln Ala Thr Met Asp Lys Gly Arg Asp Gly Cys Arg Val  
435 440 445

Pro Ile Pro Trp Thr Ala Ala Asn Glu Pro Thr Leu Ala Asp Phe Ser  
450 455 460

Arg Pro Ile Pro Ala Asp Asp Gly Thr Gly Glu Asn His Val Pro Leu  
465 470 475 480

Cys Ala Ala Gly Gln Phe Gly Thr Gly Ala Ser Phe Gly Phe Ser Pro  
485 490 495

Ala Thr Arg Ala Glu Gly Val Thr Pro Ala Ala Asp Pro His Leu Pro  
500 505 510

Gln Pro Leu Trp Phe Lys Asp Tyr Ala Val Asp Val Glu Gln Ala Asp  
515 520 525

Pro Asp Ser Met Leu Ala Leu Tyr His Ala Ala Leu Ala Ile Arg Gln  
530 535 540

Glu Ser Leu Thr Ala Thr Arg Asp Thr Thr Ala Glu Gln Val Asp Met  
545 550 555 560

Gly Pro Asp Val Val Ala Tyr Thr Arg Ala Ala Val Gly Gly Arg Thr  
565 570 575

Phe Thr Ser Ile Thr Asn Phe Gly Thr Glu Pro Val Glu Leu Pro Gly  
580 585 590

Gly Ser Val Val Leu Thr Ser Gly Pro Leu Thr Pro Asp Gly Gln Leu  
595 600 605

Pro Thr Asp Thr Ser Ala Trp Val Ile Lys  
610 615

<210> 38

<211> 1653

<212> DNA

<213> Bacillus and Bifidobacterium breve

<400> 38  
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attggtgatc tcaaaggtat tacgagtaaa ttggattatt tgcaaaagtt aggggttatg 180  
gctatttggc tatctccagt ttatgatagc cccatggatg acaatggcta tgacattgcg 240  
aactatgaag caattgcgga tatttttggc aatatggctg atatggataa tttgctgacg 300  
caggcaaaaa tgcgcgacat aaaaatcatt atggatctag tggttaatca tacctcagat 360  
gaacatactt ggtttattga agcacgtgag catccagaca gttctgaacg cgattattat 420  
atttggtgtg accagccaaa tgatttgga tctattttcg gtggttctgc ttggcagtat 480  
gatgataagt ccgatcaata ttatttgcatt ttttttagta agaagcagcc agatctaaac 540  
tgggaaaacg caaacttacg tcagaagatt tatgatatga tgaatttctg gattgataaa 600  
ggtattggcg gctttcggat ggacgtcatt gatatgattg ggaaaattcc tgctcagcat 660  
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caatattcaa atccagtcaa tcacgaactc tctatgattt ttcaatttga acatattggt 840  
cttcagcata aaccagaagc tcctaaatgg gattatgtga aggaacttaa tgttcctgct 900  
ttaaaaacaa tctttaataa atggcagact gagttggaat taggacaggg gtggaattcg 960  
ttattctgga ataaccatga cctgcctcgt gttttatcaa tctggggaaa tacgggcaaa 1020  
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tatatttatc aagggtgaaga gattgggatg accaattatc cttttaaaga tttaaataaa 1140  
cttgatgata ttgaatcact taattatgct aaggaagctt ttacaaatgg taagtctatg 1200  
gaaactatca tggacagtat tcgtatgatt ggccgtgata atgccagaac acctatgcaa 1260  
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ccttgggatg ctttttgtat taagataaac taa 1653

<210> 39  
<211> 550  
<212> PRT  
<213> Bacillus and Bifidobacterium breve

<400> 39

Met Ser Leu Thr Ile Ser Leu Pro Gly Val Gln Ala Ser Ala Met Gln  
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Lys His Trp Trp His Lys Ala Thr Val Tyr Gln Ile Tyr Pro Lys Ser  
 20 25 30  
 Phe Met Asp Thr Asn Gly Asp Gly Ile Gly Asp Leu Lys Gly Ile Thr  
 35 40 45  
 Ser Lys Leu Asp Tyr Leu Gln Lys Leu Gly Val Met Ala Ile Trp Leu  
 50 55 60  
 Ser Pro Val Tyr Asp Ser Pro Met Asp Asp Asn Gly Tyr Asp Ile Ala  
 65 70 75 80  
 Asn Tyr Glu Ala Ile Ala Asp Ile Phe Gly Asn Met Ala Asp Met Asp  
 85 90 95  
 Asn Leu Leu Thr Gln Ala Lys Met Arg Asp Ile Lys Ile Ile Met Asp  
 100 105 110  
 Leu Val Val Asn His Thr Ser Asp Glu His Thr Trp Phe Ile Glu Ala  
 115 120 125  
 Arg Glu His Pro Asp Ser Ser Glu Arg Asp Tyr Tyr Ile Trp Cys Asp  
 130 135 140  
 Gln Pro Asn Asp Leu Glu Ser Ile Phe Gly Gly Ser Ala Trp Gln Tyr  
 145 150 155 160  
 Asp Asp Lys Ser Asp Gln Tyr Tyr Leu His Phe Phe Ser Lys Lys Gln  
 165 170 175  
 Pro Asp Leu Asn Trp Glu Asn Ala Asn Leu Arg Gln Lys Ile Tyr Asp  
 180 185 190  
 Met Met Asn Phe Trp Ile Asp Lys Gly Ile Gly Gly Phe Arg Met Asp  
 195 200 205  
 Val Ile Asp Met Ile Gly Lys Ile Pro Ala Gln His Ile Val Ser Asn  
 210 215 220  
 Gly Pro Lys Leu His Ala Tyr Leu Lys Glu Met Asn Ala Ala Ser Phe  
 225 230 235 240  
 Gly Gln His Asp Leu Leu Thr Val Gly Glu Thr Trp Gly Ala Thr Pro  
 245 250 255  
 Glu Ile Ala Lys Gln Tyr Ser Asn Pro Val Asn His Glu Leu Ser Met  
 260 265 270  
 Ile Phe Gln Phe Glu His Ile Gly Leu Gln His Lys Pro Glu Ala Pro  
 275 280 285  
 Lys Trp Asp Tyr Val Lys Glu Leu Asn Val Pro Ala Leu Lys Thr Ile

290		295		300
Phe Asn Lys Trp Gln Thr Glu Leu Glu Leu Gly Gln Gly Trp Asn Ser				
305		310	315	320
Leu Phe Trp Asn Asn His Asp Leu Pro Arg Val Leu Ser Ile Trp Gly				
	325	330		335
Asn Thr Gly Lys Tyr Arg Glu Lys Ser Ala Lys Ala Leu Ala Ile Leu				
	340	345		350
Leu His Leu Met Arg Gly Thr Pro Tyr Ile Tyr Gln Gly Glu Glu Ile				
	355	360		365
Gly Met Thr Asn Tyr Pro Phe Lys Asp Leu Asn Glu Leu Asp Asp Ile				
	370	375		380
Glu Ser Leu Asn Tyr Ala Lys Glu Ala Phe Thr Asn Gly Lys Ser Met				
	385	390		395
Glu Thr Ile Met Asp Ser Ile Arg Met Ile Gly Arg Asp Asn Ala Arg				
	405	410		415
Thr Pro Met Gln Trp Asp Ala Ser Gln Asn Ala Gly Phe Ser Thr Ala				
	420	425		430
Asp Lys Thr Trp Leu Pro Val Asn Pro Asn Tyr Lys Asp Ile Asn Val				
	435	440		445
Gln Ala Ala Leu Lys Asn Ser Asn Ser Ile Phe Tyr Thr Tyr Gln Gln				
	450	455		460
Leu Ile Gln Leu Arg Lys Glu Asn Asp Trp Leu Val Asp Ala Asp Phe				
	465	470		475
Glu Leu Leu Pro Thr Ala Asp Lys Val Phe Ala Tyr Leu Arg Lys Val				
	485	490		495
Arg Glu Glu Arg Tyr Leu Ile Val Val Asn Val Ser Asp Gln Glu Glu				
	500	505		510
Val Leu Glu Ile Asp Val Asp Lys Gln Glu Thr Leu Ile Ser Asn Thr				
	515	520		525
Asn Glu Ser Ala Ala Leu Ala Asn His Lys Leu Gln Pro Trp Asp Ala				
	530	535		540
Phe Cys Ile Lys Ile Asn				
545	550			

<210> 40  
<211> 1860

<212> DNA  
<213> Bacillus and Bifidobacterium breve

<400> 40  
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aacgccgtcg tctaccagat ttaccacgt tccttcagg acacgaacgg cgatggtttc 180  
ggagatctta agggcattac ttccgcctc gactatcttg ccgacctcg cgtggatgty 240  
ctgtggctct ccccgggtcta cagggtcccc caagacgaca acggctacga catctccgac 300  
taccgggaca tcgacccgct gttcggcacg ctcgacgaca tggacgagct gctcgccgaa 360  
gcgcacaagc gcggcctcaa gatcgtgatg gacctggtcg tcaaccacac ctccgacgag 420  
cacgcgtggt tcgaggcgtc gaaggacaag gacgacccgc acgccgactg gtactggtgg 480  
cgtcccgccc gccccggcca cgagcccggc acgcccggcg ccgagccgaa ccagtggggc 540  
tcctacttcg gcggctccgc atgggaatat tgccccgagc gtggtgagta ctatctccac 600  
cagttctcga agaagcagcc ggacctcaac tgggagaacc cggccgtacg ccgagccgtg 660  
tacgacatga tgaactggtg gctcgatcgc ggcacgacg gcttccgcat ggacgtcatc 720  
accctgatct ccaagcgcac ggatgcaaac ggcaggctgc ccggcgagac cggttccgag 780  
ctgcaggacc tgccggtggg ggaggagggc tactccaacc cgaaccggt ctgcgccgac 840  
ggtccgcgtc aggacgagtt cctcgccgag atgcgcccg aggtgttcga cgggcgtgac 900  
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gaccccgcca acggcgagct ggatatgctc ttctgttcg aacacatggg cgtcgaccaa 1020  
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gccgaacaac aggacgcat cgcccgcac ggctgggcca gcctgttcct cgacaaccac 1140  
gaccagccgc gtgtcgtctc ccgttggggc gacgacacca gcaagaccgg ccgcatccgc 1200  
tccgccaagg cgctcgcgt gctgctgcac atgcaccgcg gactccgta tgtctaccag 1260  
ggcgaggagc tcggcatgac caatgcgcac ttcacctgc tcgaccagta ccgcgacctc 1320  
gaatccatca acgcctacca tcaacgcgtc gaggaaccg ggatacggac atcgagacc 1380  
atgatgcgat ccctcgccc atacggcagg gacaacgcgc gaccccgat gcaatgggac 1440  
gactccacct acgccggctt caccatgccc gacgccccg tcgaaccctg gatcgccgtc 1500  
aaccgaacc acacggagat caacgccgcc gacgagatcg acgacccga ctccgtgtac 1560  
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taccgacgcg tggaaccgg aaacgaccgg atcatgcct tcaccagaac cctcgacgag 1680  
cgaaccatcc tcaccgtcat caacctctc cccacacagg ccgacccggc cggagaactg 1740  
gaaacgatgc ccgacggcac gatcctcatc gccaacacgg acgatcccgt aggaaacctg 1800  
aaaaccacgg gaacactcgg accatgggag gcgttcgcca tggaaaccga tccggaataa 1860

<210> 41  
<211> 619

<212> PRT  
<213> Bacillus and Bifidobacterium breve

<400> 41

Met Ser Leu Thr Ile Ser Leu Pro Gly Val Gln Ala Ser Ala Met Met  
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Thr Ser Phe Asn Arg Glu Pro Leu Pro Asp Ala Val Arg Thr Asn Gly  
20 25 30  
Ala Ser Pro Asn Pro Trp Trp Ser Asn Ala Val Val Tyr Gln Ile Tyr  
35 40 45  
Pro Arg Ser Phe Gln Asp Thr Asn Gly Asp Gly Phe Gly Asp Leu Lys  
50 55 60  
Gly Ile Thr Ser Arg Leu Asp Tyr Leu Ala Asp Leu Gly Val Asp Val  
65 70 75 80  
Leu Trp Leu Ser Pro Val Tyr Arg Ser Pro Gln Asp Asp Asn Gly Tyr  
85 90 95  
Asp Ile Ser Asp Tyr Arg Asp Ile Asp Pro Leu Phe Gly Thr Leu Asp  
100 105 110  
Asp Met Asp Glu Leu Leu Ala Glu Ala His Lys Arg Gly Leu Lys Ile  
115 120 125  
Val Met Asp Leu Val Val Asn His Thr Ser Asp Glu His Ala Trp Phe  
130 135 140  
Glu Ala Ser Lys Asp Lys Asp Asp Pro His Ala Asp Trp Tyr Trp Trp  
145 150 155 160  
Arg Pro Ala Arg Pro Gly His Glu Pro Gly Thr Pro Gly Ala Glu Pro  
165 170 175  
Asn Gln Trp Gly Ser Tyr Phe Gly Gly Ser Ala Trp Glu Tyr Cys Pro  
180 185 190  
Glu Arg Gly Glu Tyr Tyr Leu His Gln Phe Ser Lys Lys Gln Pro Asp  
195 200 205  
Leu Asn Trp Glu Asn Pro Ala Val Arg Arg Ala Val Tyr Asp Met Met  
210 215 220  
Asn Trp Trp Leu Asp Arg Gly Ile Asp Gly Phe Arg Met Asp Val Ile  
225 230 235 240  
Thr Leu Ile Ser Lys Arg Thr Asp Ala Asn Gly Arg Leu Pro Gly Glu  
245 250 255

Thr Gly Ser Glu Leu Gln Asp Leu Pro Val Gly Glu Glu Gly Tyr Ser  
260 265 270

Asn Pro Asn Pro Phe Cys Ala Asp Gly Pro Arg Gln Asp Glu Phe Leu  
275 280 285

Ala Glu Met Arg Arg Glu Val Phe Asp Gly Arg Asp Gly Phe Leu Thr  
290 295 300

Val Gly Glu Ala Pro Gly Ile Thr Ala Glu Arg Asn Glu His Ile Thr  
305 310 315 320

Asp Pro Ala Asn Gly Glu Leu Asp Met Leu Phe Leu Phe Glu His Met  
325 330 335

Gly Val Asp Gln Thr Pro Glu Ser Lys Trp Asp Asp Lys Pro Trp Thr  
340 345 350

Pro Ala Asp Leu Glu Thr Lys Leu Ala Glu Gln Gln Asp Ala Ile Ala  
355 360 365

Arg His Gly Trp Ala Ser Leu Phe Leu Asp Asn His Asp Gln Pro Arg  
370 375 380

Val Val Ser Arg Trp Gly Asp Asp Thr Ser Lys Thr Gly Arg Ile Arg  
385 390 395 400

Ser Ala Lys Ala Leu Ala Leu Leu Leu His Met His Arg Gly Thr Pro  
405 410 415

Tyr Val Tyr Gln Gly Glu Glu Leu Gly Met Thr Asn Ala His Phe Thr  
420 425 430

Ser Leu Asp Gln Tyr Arg Asp Leu Glu Ser Ile Asn Ala Tyr His Gln  
435 440 445

Arg Val Glu Glu Thr Gly Ile Arg Thr Ser Glu Thr Met Met Arg Ser  
450 455 460

Leu Ala Arg Tyr Gly Arg Asp Asn Ala Arg Thr Pro Met Gln Trp Asp  
465 470 475 480

Asp Ser Thr Tyr Ala Gly Phe Thr Met Pro Asp Ala Pro Val Glu Pro  
485 490 495

Trp Ile Ala Val Asn Pro Asn His Thr Glu Ile Asn Ala Ala Asp Glu  
500 505 510

Ile Asp Asp Pro Asp Ser Val Tyr Ser Phe His Lys Arg Leu Ile Ala  
515 520 525

Leu Arg His Thr Asp Pro Val Val Ala Ala Gly Asp Tyr Arg Arg Val  
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530

535

540

Glu Thr Gly Asn Asp Arg Ile Ile Ala Phe Thr Arg Thr Leu Asp Glu  
 545 550 555 560

Arg Thr Ile Leu Thr Val Ile Asn Leu Ser Pro Thr Gln Ala Ala Pro  
 565 570 575

Ala Gly Glu Leu Glu Thr Met Pro Asp Gly Thr Ile Leu Ile Ala Asn  
 580 585 590

Thr Asp Asp Pro Val Gly Asn Leu Lys Thr Thr Gly Thr Leu Gly Pro  
 595 600 605

Trp Glu Ala Phe Ala Met Glu Thr Asp Pro Glu  
 610 615

<210> 42  
 <211> 1653  
 <212> DNA  
 <213> Bacillus and Streptococcus mutans

<400> 42  
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 attggtgatc tcaaaggtat tacgagtaaa ttggattatt tgcaaaagtt aggggttatg 180  
 gctatttggc tatctccagt ttatgatagc cccatggatg acaatggcta tgacattgcg 240  
 aactatgaag caattgcgga ttttttggc aatatggctg atatggataa tttgctgacg 300  
 caggcaaaaa tgcgcgacat aaaaatcatt atggatctag tggttaatca tacctcagat 360  
 gaacatactt ggtttattga agcacgtgag catccagaca gttctgaacg cgattattat 420  
 atttggtgtg accagccaaa tgatttggaa tctattttcg gtggttctgc ttggcagtat 480  
 gatgataagt ccgatcaata ttatttgcatt ttttttagta agaagcagcc agatctaaac 540  
 tgggaaaacg caaacttacg tcagaagatt tatgatatga tgaatttctg gattgataaa 600  
 ggtattggcg gctttcggat ggacgtcatt gatatgattg ggaaaattcc tgctcagcat 660  
 attgtcagta acggaccaaa attgcatgct tatcttaagg agatgaatgc cgctagtttt 720  
 ggtcaacatg atctgctgac tgtgggggaa acttggggag caacgcctga gattgcgaag 780  
 caatattcaa atccagtcaa tcacgaactc tctatgattt ttcaatttga acatattggt 840  
 cttcagcata aaccagaagc tcctaaatgg gattatgtga aggaacttaa tgttcctgct 900  
 ttaaaaaaaa tctttaataa atggcagact gagttggaat taggacaggg gtggaattcg 960  
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 tatatttatc aaggtgaaga gattgggatg accaattatc cttttaaaga tttaaataaa 1140  
 cttgatgata ttgaatcact taattatgct aaggaagctt ttacaaatgg taagtctatg 1200



gaaactatca tggacagtat tcgtatgatt ggccgtgata atgccagaac acctatgcaa 1260  
 tgggatgctt ctcaaaatgc cggattttca acagcggata aaacatggct gccagttaat 1320  
 ccaaactata aagacatcaa tgttcaagca gctctgaaaa attccaattc tatcttttac 1380  
 acctatcaac aactcattca gcttcgaaaa gaaaatgatt ggctagtaga tgccgatttt 1440  
 gaattgctcc ctacagcgga caaagtatgt gcctatttac gaaaggtaag agaagaaagg 1500  
 tatcttatag tggatcaatgt ttcagatcag gaagaagttc tagagattga tggatgacaaa 1560  
 caagaaactc tcattagcaa tacaaatgaa agcgtctgctc ttgccaatca caaactccag 1620  
 ccttgggatg ctttttgtat taagataaac taa 1653

<210> 43  
 <211> 550  
 <212> PRT  
 <213> Bacillus and Streptococcus mutans  
 <400> 43

Met Ser Leu Thr Ile Ser Leu Pro Gly Val Gln Ala Ser Ala Met Gln  
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Lys His Trp Trp His Lys Ala Thr Val Tyr Gln Ile Tyr Pro Lys Ser  
 20 25 30

Phe Met Asp Thr Asn Gly Asp Gly Ile Gly Asp Leu Lys Gly Ile Thr  
 35 40 45

Ser Lys Leu Asp Tyr Leu Gln Lys Leu Gly Val Met Ala Ile Trp Leu  
 50 55 60

Ser Pro Val Tyr Asp Ser Pro Met Asp Asp Asn Gly Tyr Asp Ile Ala  
 65 70 75 80

Asn Tyr Glu Ala Ile Ala Asp Ile Phe Gly Asn Met Ala Asp Met Asp  
 85 90 95

Asn Leu Leu Thr Gln Ala Lys Met Arg Asp Ile Lys Ile Ile Met Asp  
 100 105 110

Leu Val Val Asn His Thr Ser Asp Glu His Thr Trp Phe Ile Glu Ala  
 115 120 125

Arg Glu His Pro Asp Ser Ser Glu Arg Asp Tyr Tyr Ile Trp Cys Asp  
 130 135 140

Gln Pro Asn Asp Leu Glu Ser Ile Phe Gly Gly Ser Ala Trp Gln Tyr  
 145 150 155 160

Asp Asp Lys Ser Asp Gln Tyr Tyr Leu His Phe Phe Ser Lys Lys Gln  
 165 170 175

Pro Asp Leu Asn Trp Glu Asn Ala Asn Leu Arg Gln Lys Ile Tyr Asp  
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Leu Ile Gln Leu Arg Lys Glu Asn Asp Trp Leu Val Asp Ala Asp Phe  
 465 470 475 480  
 Glu Leu Leu Pro Thr Ala Asp Lys Val Phe Ala Tyr Leu Arg Lys Val  
 485 490 495  
 Arg Glu Glu Arg Tyr Leu Ile Val Val Asn Val Ser Asp Gln Glu Glu  
 500 505 510  
 Val Leu Glu Ile Asp Val Asp Lys Gln Glu Thr Leu Ile Ser Asn Thr  
 515 520 525  
 Asn Glu Ser Ala Ala Leu Ala Asn His Lys Leu Gln Pro Trp Asp Ala  
 530 535 540  
 Phe Cys Ile Lys Ile Asn  
 545 550